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(71) Applicant
Alfred Teves GmbH (FR Germany),
7 Guerickestrasse, 6000 Frankfurt am Main, Federal Republic of Germany

(72) Inventors
Rudolf Thiel,
Hans Bungert,
Michael Weidenweber

(74) Agent and/or Address for Service
J. C. Vaufrouard,
ITT Patent Department UK, Maidstone Road, Foots Cray, Sidcup DA14 5HT

(56) Documents cited

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(58) Field of search
F2E

(54) Floating caliper spot-type disc brake

(57) The brake comprises a brake carrier and a caliper (20) straddling a brake disc (8) and brake shoes and being axially slidable relative to said brake carrier, said brake carrier or said caliper, respectively, being provided with at least one pin (22) which is guided in a bore (14) of said caliper or of the said brake carrier, respectively, and an intermediate layer (40) is provided between pin (22) and bore (14) to prevent metallic contact therebetween. Layer (40) may be applied onto pin (22) or bore (14) and may comprise layer of sliding varnish. Alternatively it may comprise an adhesion-active sub-layer (e.g. zinc phosphate) provided directly on metal surface and onto zinc phosphate layer is then applied a layer of sliding varnish comprising dry lubricant system containing e.g. fluorocarbon, or molydenum sulphite and graphite in heat convertible resin,. After curving, grease may be provided and as shown a lubricating groove (23) runs helically around pin (22).

Fig. 3

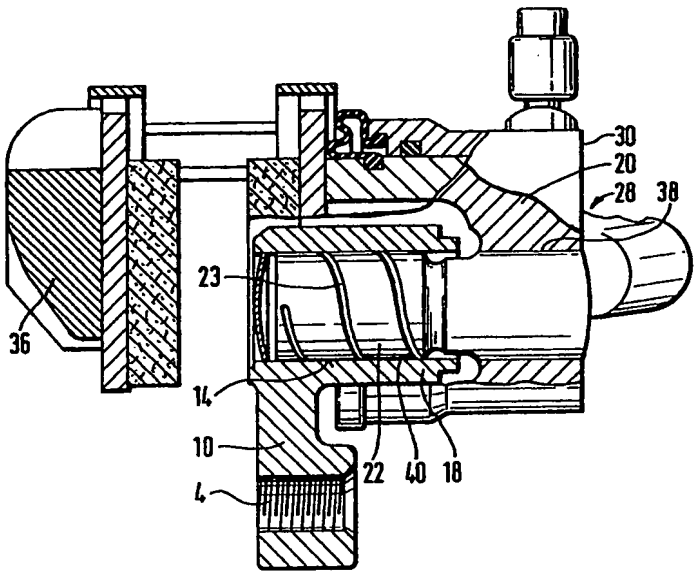

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Fig. 1

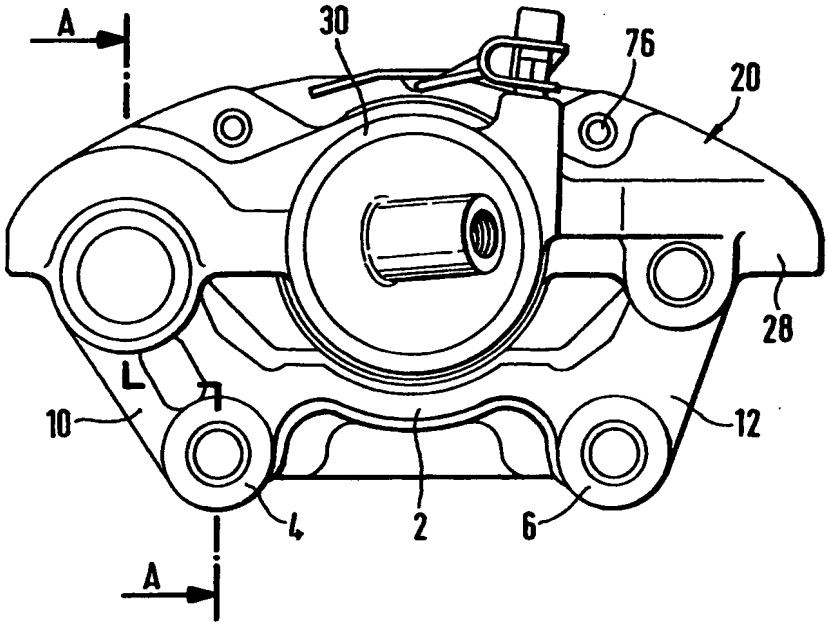

Fig. 2

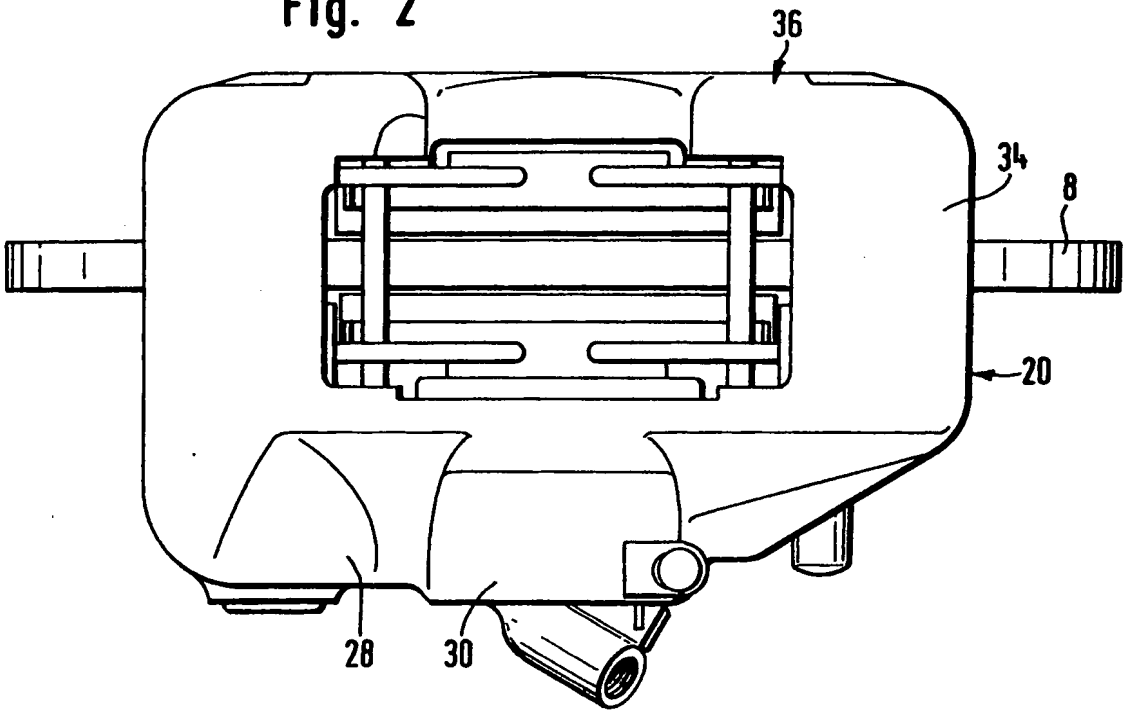

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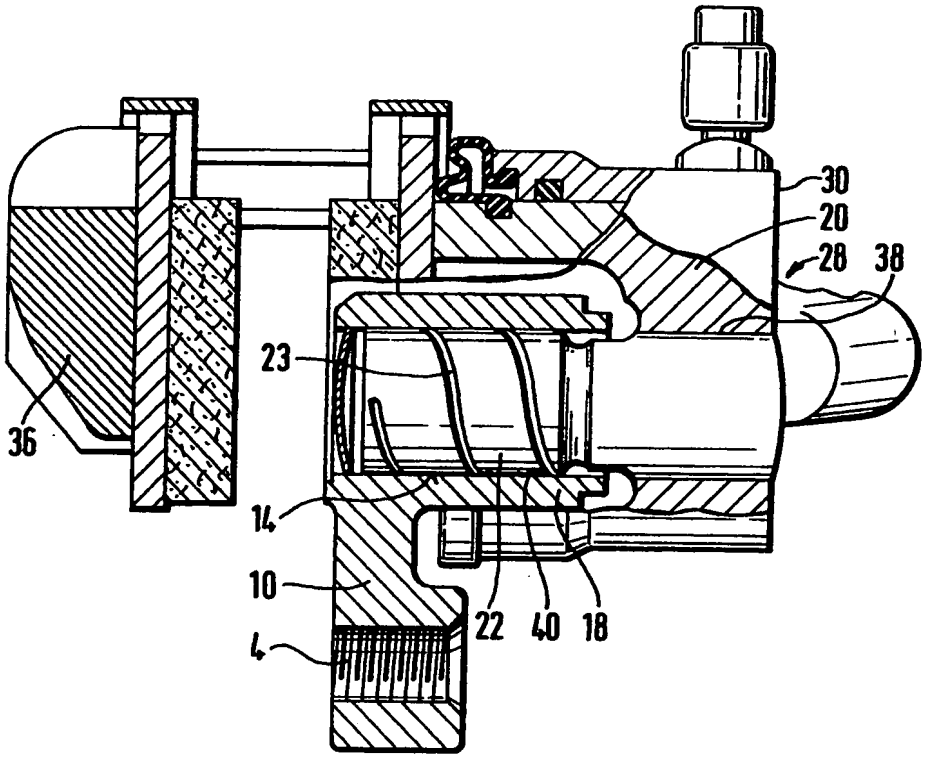
Fig. 3



SPECIFICATION

A floating caliper spot type disc brake

This invention relates to a floating caliper spot-type disc brake and in particular to a pin guide, and a process for its manufacture, for a caliper of a floating caliper spot-type disc brake, the disc brake comprising a brake carrier and the caliper, the caliper straddling a brake disc and brake shoes and being axially slidable relative to the said brake carrier, said brake carrier or said caliper, respectively, being provided with at least one pin which is guided in a bore of the said caliper or said brake carrier, respectively.

A guide of this kind is, for example, described in the German printed and published patent application 3,323,737. In such a guide in which the forces occurring during braking action are absorbed in essence by a carrying pin, a damage of the guide areas of the pin guide and, consequently, a functional failure may happen in case of extended operation.

The present invention has, therefore, the object to improve the known pin guide in such a manner that damage of the guide areas and thus a functional failure are prevented even in case of an extended service life.

According to one aspect of the present invention, there is provided a pin guide for a caliper of a floating caliper spot-type disc brake, the disc brake comprising a brake carrier and the caliper, the caliper straddling a brake disc and brake shoes and being axially slidable relative to the said brake carrier, said brake carrier or said caliper, respectively, being provided with at least one pin which is guided in a bore of the said caliper or said brake carrier, respectively, characterised in that between the said pin and the said bore, there is provided an intermediate layer which permanently prevents any metallic contact between the pin and the bore.

According to another aspect of the present invention, there is provided a process for the manufacture of a pin guide for a caliper of a floating caliper spot-type disc brake, the brake disc comprising a brake carrier and the caliper, the caliper straddling a brake disc and brake shoes and being axially slidable relative to the said brake carrier, said brake carrier or said caliper, respectively, being provided with at least one pin which is guided in a bore of the said caliper or said brake carrier, respectively, characterised in that in a pre-treatment step, one component metal part of the said guide is furnished with an adhesion-active layer, in that in a further step, a layer of sliding varnish is applied, and in that a curing takes place afterward.

The inventive solution creates a pin guide with narrow tolerances, furnished with a longlife lubrication and preserving an unrestricted operating ability over a wide temperature range from approximately -40°C to +180°C. To fulfull its function, namely to guide the caliper and to transmit the major braking forces, the guide is distinguished by a low coefficient of friction in the order of maximum 0.15 in accordance with the constructional conditions of the caliper. The formation of fretting corrosion (tribooxydation) is excluded in the inventional pin guide, as a result whereof the guide remains operable in any case, even on very long service times. As a consequence, the guide offers the further advantages of a uniform wear and, therefore, of a longer service life of the linings.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a front view of a spot-type disc brake;

Figure 2 is a top plan view of the spot-type disc brake shown in Figure 1, and

Figure 3 is a cros-section along the line A-A through the spot-type disc brake in Figure 1.

The spot-type disc brake illustrated in the drawings is intended to be mounted in an automotive vehicle. It is furnished with a brake carrier 2 being boltable or securable in some other way to a steering knuckle, to the axle or to another structural member of the wheel suspension of the vehicle at the side of a brake disc 8 by means of mounting eys 4, 6. The brake carrier 2 is formed with two brake carrier arms 10, 12 being substantially arranged in a V-shaped configuration and provided with bores at their radially external ends, only one of which bores being visible in Figure 3. In that configuration, the forementioned bore 14 in the brake carrier arm 10 is arranged in an attachment 18 extending axially at the external end of the brake carrier arm 10. A carrying pin 22 coupled to a brake caliper 20 is axially slidably received in the bore 14 as will be described in more detail further on. In the other, not visible, bore of the brake carrier arm 12, there is secured an axially extending guide pin (not shown in the drawing) which is axially slidable in an axially directed bore provided in the brake caliper. Moreover, the pin guide system of the caliper may be conceived in that the carrying pin 22 is received in the brake carrier arm 10 and the axially slidable bore 14 provided in the brake caliper 20.

The brake caliper 20 is substantially shell-shaped and comprises a first, radially extending stem 28 forming a brake cylinder 30 which receives a brake piston (not shown in the drawing). The stem 28 is succeeded by a bridge portion 34 which straddles the brake disc 8. On its other side, the bridge portion 34 ends up in a further radially extending stem 36. Beside the brake cylinder 30, there is provided an axially extending bore 38 in the stem 28, in which bore 38 the carrying pin 22 is secured which, also extends in axial direction. With its free end projecting from the bore 38, the carrying pin 22 engages in the bore 14 of the brake carrier arm 10 and is axially slidable therein as already outlined above. The free end of the carrying pin 22 may be furnished, optionally with a lubricating groove 23 running helically around its periphery. In this context, the diameters of the carrying pin 22 and of the bore 14 are harmonised such that the carrying pin 22 forms a fixed bearing in conjunction with the bore 14. As a consequence, very narrow tolerances are necessary for the pin guide.

In between the guide constituted by the carrying pin 22 and the bore 14, there is provided an intermediate layer 40 comprising at least two component sublayers arranged one on top of the other, the intermediate layer 40 being applied onto the carrying pin 22 in the embodiment being considered but being adapted to be applied in a similar manner onto the wall of the bore 14 as an alternative. By means of that intermediate layer, any metallic contact between the component parts of the guide is permanently prevented. The intermediate layer includes an adhesion-active sub-layer which is provided directly on the metal surface and is advantageously made up of a zinc phosphate layer of 3 to 5 microns thickness. Onto that zinc phosphate layer, there is applied a layer of sliding varnish as a second sublayer, having a thickness in the range of 5 to 20 microns, expediently a thickness of 12 ± 4 microns. The layer of sliding varnish comprises a dry lubricant system containing molybdenum sulphite and graphite in a heat convertible resin. Instead of molybdenum sulphite and graphite, a fluorocarbon may be utilised as an alternative. Greasing with a special grease may be provided additionally.

The process for the manufacture of the pin guide provides that in a pretreatment step an adhesion-active sublayer of zinc phosphate is applied first of all on one component part of the guide, that is on the carrying pin 22 or on the wall of the bore 14. Then a further layer constituted of sliding varnish is applied, succeeded by a curing step of one hour duration, expediently at a temperature of 180°C. Finally, in a last step, greasing with a special grease may be carried out.

It is, moreover, possible to apply the layer of sliding varnish directly onto the metal surface without an adhesion-active intermediate layer.

CLAIMS

1. A pin guide for a caliper of a floating caliper spot-type disc brake, the disc brake comprising a brake carrier and the caliper, the caliper straddling a brake disc and brake shoes and being axially slidable relative to the said brake carrier, said brake carrier or said caliper, respectively, being provided with at least one pin which is guided in a bore of the said caliper or said brake carrier, respectively, characterised in that between the said pin (22) and the said bore (14), there is provided an intermediate layer (40) which permanently prevents any metallic contact between the pin and the bore.

2. A pin guide as claimed in claim 1, characterised in that the said pin (22) is the main carrying pin of the brake which absorbs the major proces occurring during braking action.

3. A pin guide as claimed in claim 1 or claim 2, characterised in that the said intermediate layer (40) comprises an adhesion-active sublayer.

4. A pin guide as claimed in claim 3, characterised in that the said sublayer contains zinc phosphate.

5. A pin guide as claimed in claim 3 or claim 4, characterised in that the thickness of the said adhesion-active sub-layer is in the range 3 to 5 microns.

6. A pin guide as claimed in any one of the preceding claims, characterised in that the said intermediate layer comprises a layer of sliding varnish.

7. A pin guide as claimed in claim 3, characterised in that a layer of sliding varnish is provided in addition to the said adhesion-active sub-layer.

8. A pin guide as claimed in claim 6 or claim 7, characterised in that the said layer of sliding varnish has a thickness in the range 5 to 20 microns.

9. A pin guide as claimed in claim 8, characterised in that the said layer of sliding varnish has a thickness of 12 ± 4 microns.

10. A pin guide as claimed in any one of claims 6 to 9, characterised in that the said layer of sliding varnish contains molybdenum disulphite.

11. A pin guide as claimed in any one of claims 6 to 10, characterised in that the said layer of sliding varnish contains graphite.

12. A pin guide as claimed in any one of claims 6 to 9, characterised in that the said layer of sliding varnish contains a fluorocarbon.

13. A pin guide as claimed in any one of claims 6 to 12, characterised in that the said layer of sliding varnish comprises a heat convertible resin binder.

14. A pin guide as claimed in any one of the preceding claims, characterised in that on the said intermediate layer (40), there is provided an additional greasing layer.

15. A process for the manufacture of a pin guide for a caliper of a floating caliper spot-type disc brake, the brake disc comprising a brake carrier and the caliper, the caliper straddling a brake disc and brake shoes and being axially slidable relative to the said brake carrier, said brake carrier or said caliper, respectively, being provided with at least one pin which is guided in a bore of the said caliper or said brake carrier, respectively, characterised in that in a pretreatment step, one component metal part of the said guide is furnished with an adhesion-active layer, in that in a further step, a layer of sliding varnish is applied, and in that a curing takes place afterward.

16. A process as claimedin claim 15, characterised in that the said curing is carried out at a temperature of approximately 180°C.

17. A process as claimed in claim 16, characterised in that the curing time amounts to approximately one hour.

18. A pin guide for a caliper of a floating caliper spot-type disc brake substantially as herein described with reference to the accompanying drawings.

19. A process for the manufacture of a pin guide for a caliper of a floating caliper spot-type disc brake substantially as herein described with reference to the accompanying drawings.

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